DOE–LM/1497–2007

# Erosion Control Plan for Rocky Flats Property Central Operable Unit

July 2007

U.S. Department of Energy

Office of Legacy Management

*Work Performed Under DOE Contract No. DE–AC01–02GJ79491*
*for the U.S. Department of Energy Office of Legacy Management.*

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**U.S. Department of Energy**
**Office of Legacy Management**

# Rocky Flats Site

# Erosion Control Plan for Rocky Flats Property Central Operable Unit

## July 2007

Work Performed by S.M. Stoller Corporation under DOE Contract No. DE–AC01–02GJ79491
for the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado

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# 1.0 Introduction

Two Operable Units (OUs) are within the boundaries of the Rocky Flats property: the Peripheral OU and the Central OU. The Central OU consolidates all areas of the site that require additional remedial/corrective actions, while also considering practicalities of future land management. The Peripheral OU includes the remaining, generally unimpacted portions of the site, and surrounds the Central OU.

The response action in the final Corrective Action Decision/Record of Decision (CAD/ROD) is no action for the Peripheral OU, and institutional and physical controls with continued monitoring for the Central OU. The requirements of the remedy are implemented in accordance with Rocky Flats Legacy Management Agreement (RFLMA) and the environmental covenant for the Central OU granted by the U.S. Department of Energy (DOE) to the Colorado Department of Public Health and the Environment (CDPHE). RFLMA includes a Site Map showing the Central and Peripheral OU boundaries.

DOE Legacy Management (LM) has jurisdiction and control of the Rocky Flats property until such time jurisdiction and control of a portion of the Peripheral OU is transferred to the US Fish and Wildlife Service for the purposes of establishing the Rocky Flats National Wildlife Refuge. The remainder of the Peripheral OU, which contains areas where owners or assignees of subsurface mineral rights are actively mining in accordance with their mining permit, will remain under DOE-LM jurisdiction and control for the foreseeable future.

The institutional controls (ICs) for the Central OU include the following prohibition, objective and rationale as specified in the CAD/ROD:

> 3) No grading, excavation, digging, tilling, or other disturbance of any kind of surface soils is permitted, except in accordance with an erosion control plan (including Surface Water Protection Plans submitted to EPA under the Clean Water Act) approved by CDPHE or EPA. Any such soil disturbance will restore the soil surface to preexisting grade. *(Objective: prevent migration of residual surface soil contamination to surface water. Rationale: Certain surface soil contaminants, notably plutonium-239/240, were identified in the fate and transport evaluation in the RI as having complete pathways to surface water if disturbed. This restriction minimizes the possibility of such disturbance and resultant impacts to surface water. Restoring the soil surface to preexisting grade maintains the current depth to subsurface contamination or contaminated structures.)*

The CAD/ROD notes as additional rationale, that ICs also result in achieving compliance with the CDPHE risk management policy of ensuring that residual risks to the site user are at or below $1 \times 10^{-6}$.

The surface water referred to is those portions of Walnut and Woman Creeks in the Central OU regulated as segment 5 (North and South Walnut Creek above the outlet of terminal ponds A-4 and B-5), segment 4b (North and South Walnut Creek downstream of the terminal ponds) and segment 4 a (Woman Creek) of the Big Dry Creek watershed.

Upon approval and as discussed in the Regulatory Approach section, below, this Erosion Control Plan (ECP) meets the requirements of IC number 3, above, for surface soil disturbance activities in the Central OU.

# 2.0 Regulatory Approach

In accordance with the CAD/ROD, the selected remedy must achieve compliance with Applicable or Relevant and Appropriate Requirements (ARARs). 40 CFR 122.26 Stormwater Permit for Construction Activities, and 40 CFR 122.28 General Permits, are identified as ARARs in CAD/ROD Table 21. The Table 21 comment in relation to these ARARs provides:

> On-site remedial actions do not require permits, but remedies that discharge pollutants from point sources or that involve stormwater discharges must meet substantive requirements for a site-specific or general NPDES permit. Substantive requirements for an NPDES permit are included in the Present Landfill IM/IRA. These requirements will be carried forward into the final CAD/ROD.

The ECP addresses the best management practices (BMP) aspects of the regulatory requirements, which are designed to adequately control stormwater runoff of soils that could ultimately discharge into surface water. The purpose of these controls at Rocky Flats is to address the objective and rationale of the CAD/ROD IC that prohibits soil disturbing activities so that the RFLMA remedy performance standard for surface water is met.

While the stormwater permitting regulations do not specify a particular plan title, EPAs recent stormwater permitting guidance (EPA 2007)[1] refers to a Stormwater Pollution Prevention Plan (SWPPP). But the guidance recognizes that other plan titles, such as an erosion control plan and best management practices plan are commonly used.

Prior to the completion of cleanup and closure of Rocky Flats in accordance with the Rocky Flats Cleanup Agreement (RFCA), stormwater runoff requirements were addressed in RFCA decision documents and in the EPA approved SWPPP of the facility's National Pollution Discharge Elimination System Permit (NPDES) No. CO-0001333. The NPDES permit was terminated in accordance with regulatory requirements after inflows to the Sewage Treatment Plant (STP) were eliminated and the STP was demolished. Industrial stormwater discharges were eliminated by removal of all buildings and asphalt covered surfaces and related stormwater conveyances. The land was recontoured to approximate the conditions prior to industrialization of Rocky Flats and surface water flow was directed within functional channels. Revegetation of cleared areas was also implemented. The erosion control BMPs for these activities have been implemented and are continuing where required until the final stabilization/termination criteria in this ECP are met.

[1] Interim Guide, Developing Your Stormwater Pollution Prevention Plan, A Guide for Construction Sites, EPA 833R-060-04, January 2007.

# 3.0 Applicability

This post closure ECP applies to soil disturbing activities in the Central OU (i.e., "grading, excavation, digging, tilling, or other disturbance of any kind of surface soils"). These activities may also normally require stormwater discharge permitting because they are regulated as "construction activities" under 40 CFR 122. The ARAR permitting exemption requires the substantive requirements be met and the administrative permitting requirements are not required for construction activities performed within the Central OU.

DOE-LM does not anticipate that it will conduct any construction activities in the Peripheral OU area that would require a 40 CFR 122 stormwater discharge permit. But if such activities are to be conducted, the administrative and substantive requirements of 40 CFR 122 will be met.

# 4.0 Scope

A construction activity is regulated (i.e., must meet permit requirements) under 40 CFR 122 if it includes land disturbance ("clearing, grading, excavating") of more than one acre. Between one and five acres of disturbance is a "small construction activity".[2] A "small construction activity" does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity or original purpose of the facility.

Thus, the appropriate BMPs specified in this ECP must be implemented for any construction activity that includes land disturbance of more than one acre, unless it is a small construction activity (i.e., between one and five acres) that involves routine maintenance.

The BMPs specified in this ECP must be considered and will be implemented on a case by case basis for other soil disturbing activities.

# 5.0 Background

From 2001 through 2005 the effectiveness of erosion controls under the SWPPP was formally evaluated in annual reports (DOE 2005), based on surface water monitoring results for four storm water locations in Woman and Walnut Creeks. Although the large amount of soil disturbing work inherent in cleanup and closure activities was the likely cause of some observable soil erosion impacts to water quality, the BMPs and implementation practices used during that period were determined to be effective in mitigating pollution from storm water runoff. RFLMA required surface water monitoring includes three of the four stormwater locations used for effectiveness evaluations.

One of the locations was eliminated with the design and construction of the functional channels. Monitoring results and evaluation of the three remaining locations are included in RFLMA required quarterly and annual reports. These are GS-10 (South Walnut Creek), SW-027 (Woman Creek—South Interceptor Ditch) and SW093 (North Walnut Creek).

[2] 40 CFR 122.26(b)(14)(x) and (15).

Because of proven effectiveness, this ECP draws from the EPA approved SWPPP (DOE 2003) BMPs and implementing criteria, but is tailored to address Post Closure activities. It also based on the Rocky Flats Erosion Control Management System (ECMS) (K-H 2005) that was implemented to address erosion control measures during the final months of closure. The ECMS used a number of sources, including the Denver Urban Drainage and Flood Control District Drainage Criteria Manual (UDFDC 2001) and the Colorado Department of Transportation's Erosion Control and Stormwater Quality Guide (CDOT 2002), to develop recommended BMPs.

The final recontouring of the land incorporated many erosion control design features, including riprap, grade reduction, benched slopes, and ponding areas within functional channels. So, this ECP also presumes that BMPs used with success during the high soil disturbing activity period coupled with the final recontouring design features will continue to be successful post closure BMPs.

# 6.0 Planning Responsibility

Before a surface soil disturbance activity that is covered by this ECP may be conducted, an evaluation of potential stormwater runoff shall be performed and requirements for appropriate stormwater discharge controls identified using the Rocky Flats site specific work control procedures.

In situations where immediate stabilization for erosion control is needed, BMPs should be implemented as soon as practicable. After the initial actions, the information and planning aspects of this ECP shall be followed for continuing erosion controls.

The following information for the reasonable proximity of the soil disturbance activity shall be documented on maps and retained with the project files in accordance with Rocky Flats site specific records management requirements.

1. Drainage patterns.
2. Approximate slopes after major grading activities.
3. Areas of soil disturbance.
4. Outline of all areas not to be disturbed.
5. Location and type of all major structural and non-structure controls.
6. The location of expected stabilization practices.
7. Wetlands and surface waters.
8. Locations where stormwater may discharge to surface water.

In addition, because restoration to preexisting surface elevations is required, pre-soil disturbance and post soil disturbance elevations of the areas of soil disturbance shall be documented.

# 7.0 Best Management Practices

The following specific or general practices shall be used as appropriate to control erosion and prevent pollution of Walnut and Woman Creek stream segments 4 and 5 from stormwater runoff.

1. Install erosion control barriers around the perimeter of the construction area and up-slope of any surface water that might be impacted by stormwater flowing from the area.
2. Avoid excavation and grading activities during rain, snow, or high wind events.
3. Remove only the vegetation as required by project specifications.
4. Inspect, check, and maintain all erosion control features on a regular basis in accordance with this ECP.
5. When the ground surface has been stabilized by vegetation, remove all temporary erosion control features (if not biodegradable).
6. Stockpile materials on flat areas away from slopes and drainage ways and cover as necessary to prevent runoff of the materials.
7. Engineer excavations and phase construction activities to minimize exposed earthwork areas.
8. Avoid using straw bales when possible, but if necessary, orient bales perpendicular to overland flow, anchor, trench, and stake with 2-inch posts, not wood stakes. If used in a flow channel, they must be trenched in.
9. Silt fences are not recommended as a typical practice. They create more of an illusion of protection than actual protection and their removal may actually create additional soil disturbance. If used, silt fences need heavier stakes of 2 inches by 2 inches and pores need to be kept clean;
10. Reduce storm water runoff velocities by using straw wattles or georidges, where appropriate.
11. Immediately clean up leaks, drips, and other spills and use dry cleanup methods whenever possible and clean up and appropriately manage for disposal debris and waste material daily, in accordance with Rocky Flats site specific procedures.
12. Limit vehicle traffic to construction areas, staging areas, and existing roads.
13. Water or other approved dust suppressants may be applied to the surface of the soil during construction operations. Soil surfactants (e.g. lignin/magnesium chloride or “Pennz Suppress D”) may be used during placement of aggregate surface on potential road upgrades.
14. If fuel or chemicals need to be stored for the work determine if a spill prevention plan is required and prepare the plan.

The most often used control products are included in Appendix A, which also contains a brief description of each product method, how it works, and how it is to be installed and maintained.. These methods are those most commonly applied for post closure soil disturbance, but other generally accepted control products may also be used.

## 7.1 General Measures and Best Management Practices to Protect the Preble's Mouse

When erosion controls are implemented under this ECP, general practices and BMPs to protect the Preble's mouse when applicable must also be included. The following conditions are required by the Rocky Flats Biological Opinion (FWS 2004).

1. Identify and prioritize Preble's habitat areas that are subject to disturbance and design activities to avoid areas of higher habitat value. For example, large willow patches will be avoided, except where the project cannot be completed without impacts.
2. Reduce the impact footprint (i.e., no walking in area beyond what is necessary to accomplish the work, minimizing lay down area and equipment storage locations).
3. Conduct activities during daylight hours, when the Preble's Mouse is less active, when scheduling during the hibernation season of the mouse cannot be accomplished.
4. Minimize the length of time spent in sensitive areas (getting work done as quickly as possible, and not reentering the area once work is completed).
5. Explore options with project designers to avoid and/or minimize impacts to the Preble's Mouse.
6. Use established roads (i.e., paved, gravel, two-track, historically-used routes to monitoring locations) for vehicle traffic. If an established road does not exist, use the safest and most direct route that minimizes impacts to the habitat and has been predetermined by an entity familiar with Preble's habitat use.
7. Limit equipment entrance/exit areas to the minimum number necessary to accomplish the work.
8. Limit vegetation disturbance through alternative actions. For example, prune trees/shrubs rather than remove trees/shrubs; cut shrub stems to allow re-growth rather than grubbing out the entire root system.
9. Remove trash and unnecessary equipment in project areas after work is completed.
10. Revegetate all disturbed Preble's habitat with suitable native species at 2:1 ratio in higher quality habitat, 1.5:1 in lower quality habitat, after the activity has been completed. Refer to Table 1 and Habitat Mitigation Techniques Plan (Appendix A, Part II of the PBA).
11. When revegetation activities cannot be completed immediately after project completion (i.e., outside optimum seeding window) use alternative erosion controls to control potential erosion and sedimentation problems. Use redundant erosion controls were appropriate.
12. Utilize erosion controls (i.e., silt fence, erosion blankets, hay bales, mulching, tackifiers, surface roughening) on all appropriate cleanup projects to control erosion and sedimentation problems. Utilize photo or biodegradable erosion blankets that will not entangle Preble's and other wildlife. For large areas, minimize exposed surfaces. Project personnel will be responsible to monitor erosion control effectiveness and modify control techniques as needed (especially after precipitation events). Monitoring will be conducted weekly or more frequently as needed (after precipitation events). Projects will maintain and repair erosion controls through project completion.

13. Monitoring of mitigation actions will be conducted according to the Mitigation Monitoring plan (Appendix B of Part II of the PBA).
14. Prevent spilled fuels, lubricants or other toxic materials from entering Preble's habitat through the use of spill containment devices.
15. Minimize project activities in wet areas and wet conditions to avoid damage to the habitat.
16. Use the least amount of and/or smallest equipment necessary to accomplish the work.
17. Do not clean equipment in Preble's Mouse habitat or in areas where runoff will enter Preble's Mouse habitat.
18. Staging areas will be located either outside of Preble's habitat, or within the defined project footprint.
19. Do not use Preble's Mouse habitat as borrow areas.
20. Inspect and clean equipment of weeds/see to prevent the spread of noxious weeds to other locations.

# 8.0 Implementation

## 8.1 Documentation

The erosion controls implemented for each soil disturbance activity covered by this ECP shall be documented on maps and retained with the project files in accordance with the Rocky Flats site specific work control procedures and records management requirements.

## 8.2 Inspections

Implemented erosion control measures are inspected as part of the routine daily inspections of active soil disturbing work, or after a significant weather event has occurred. If active soil disturbing work is completed, erosion controls shall be inspected monthly until the final stabilization/termination criteria discussed below has been met.

The Present Landfill (PLF) Monitoring and Maintenance Plan (M&M Plan) requires inspection of PLF erosion controls after a significant weather event as defined in the PLF M&M Plan. Thus, when the PLF M&M Plan (which may be modified upon CDPHE approval) requires an inspection at the PLF after a significant weather event, the erosion controls covered by this ECP shall also be inspected..

Erosion control measures are inspected in terms of their placement, need for maintenance, and potential need for additional measures. Conditions needing repair or additional BMPs that are not corrected or implemented within 24 hours shall be entered into the Site Observation Log for follow up and to track close out.

## 8.3 Maintenance

Properly installed BMPs require routine maintenance. Appendix A describes the recommended maintenance for the BMPs.

# 9.0 Final Stabilization/Termination

Typically, the storm water discharge associated with a construction activity is eliminated when the area subject to erosion controls is finally stabilized.

The area is finally stabilized when all soil disturbing activities at the site have been completed and the combined foliar cover of grasses, forbs, and shrubs is at least 80% of the reference cover, or equivalent permanent stabilization measures have been employed. Reference areas are defined as adjacent undisturbed areas that will be used for comparison to the area of soil disturbance. Reference areas will have similar vegetation to what is desired for the soil disturbance area.

# 10.0 References

CDOT (Colorado Department of Transportation), 2002. *Erosion Control and Stormwater Quality Guide*, Colorado Department of Transportation, Denver, Colorado.

DOE (U.S. Department of Energy), 2005a. *Annual Comprehensive Site Compliance Evaluation Report, Rocky Flats Environmental Technology Site*, August.

DOE (U.S. Department of Energy), 2005b. *Present Landfill Monitoring and Maintenance Plan and Post-Closure Plan, Rocky Flats Environmental Technology Site*, May (including any subsequent modifications).

EPA (U.S. Environmental Protection Agency), 2007. *Interim Guide, Developing Your Stormwater Pollution Prevention Plan, A Guide for Construction Sites,* EPA 833R-060-04, January.

UDFDC (Urban Drainage and Flood Control District), 2001. *Urban Storm Drainage Criteria Manual*, Vol. 1−3, Urban Drainage and Flood Control District, Denver, Colorado.

USFWS (U.S. Fish and Wildlife Service), 2004. *Rocky Flats Programmatic Biological Assessment*, Part II, Biological Opinion, April.

# Appendix A

# Stormwater Best Management Practice (BMP)—Information Sheets

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BMPs typically used at the Rocky Flats Site include:

- Erosion bales (straw bales)
- Erosion logs (straw wattles)
- Georidge® product
- Erosion control blankets
- Turf Reinforcement Mats (TRM)
- Mulch Tackifiers/Tackifiers
- Mulching (includes straw crimping, hydromulching, and use of Flexible Growth Media [Flexterra® and similar products])

The following pages include general information about the different products. The general information pages where taken from the Erosion Control and Stormwater Quality Guide, Colorado Department of Transportation, 2002. The Georidge® and Flexterra® information is from the manufacturer.

End of current text

# SC 1: Erosion Bale

## Description

A temporary sediment barrier consisting of a row of entrenched and anchored straw, or hay bales.

## Applications

- Used as temporary sediment barriers and filters along the toe of fills or around inlets.

## Limitations

- Do not use along toe of fills where the size of the drainage area is greater than one-quarter acre per 100 feet of barrier length; maximum slope length and gradient behind the barrier is 100 feet and 50 percent (2:1), respectively.
- Do not use where effectiveness is required for more than 3 months. Useful life of erosion bale is approximately 1 year; the bales may have to be replaced one or more times during construction.
- Under no circumstances should erosion bale be constructed in flowing streams or in swales where flows are likely to exceed 1 cfs, and where the contributing drainage area is greater than 1 acre.
- Not to be used where the control of sediment is critical; in high-risk areas; in areas where they cannot be entrenched as required and firmly anchored; and areas where ponded water could flow onto the roadway.

## Installation

- The erosion bale must be entrenched and backfilled. A trench should be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked, the excavated soil must be backfilled against the barrier. Backfill soil should conform to the ground level on the downhill side and should be built up to 4 inches against the uphill side of the barrier.
- Each bale must be securely anchored by at least two wooden stakes driven toward the previously laid bale to force the bales together. Stakes should be driven into the ground a minimum of 1 foot to securely anchor

the bales. Stakes should have a minimum diameter or cross section of 2 inches. Reinforcing bars shall not be used in place of the wooden stake.

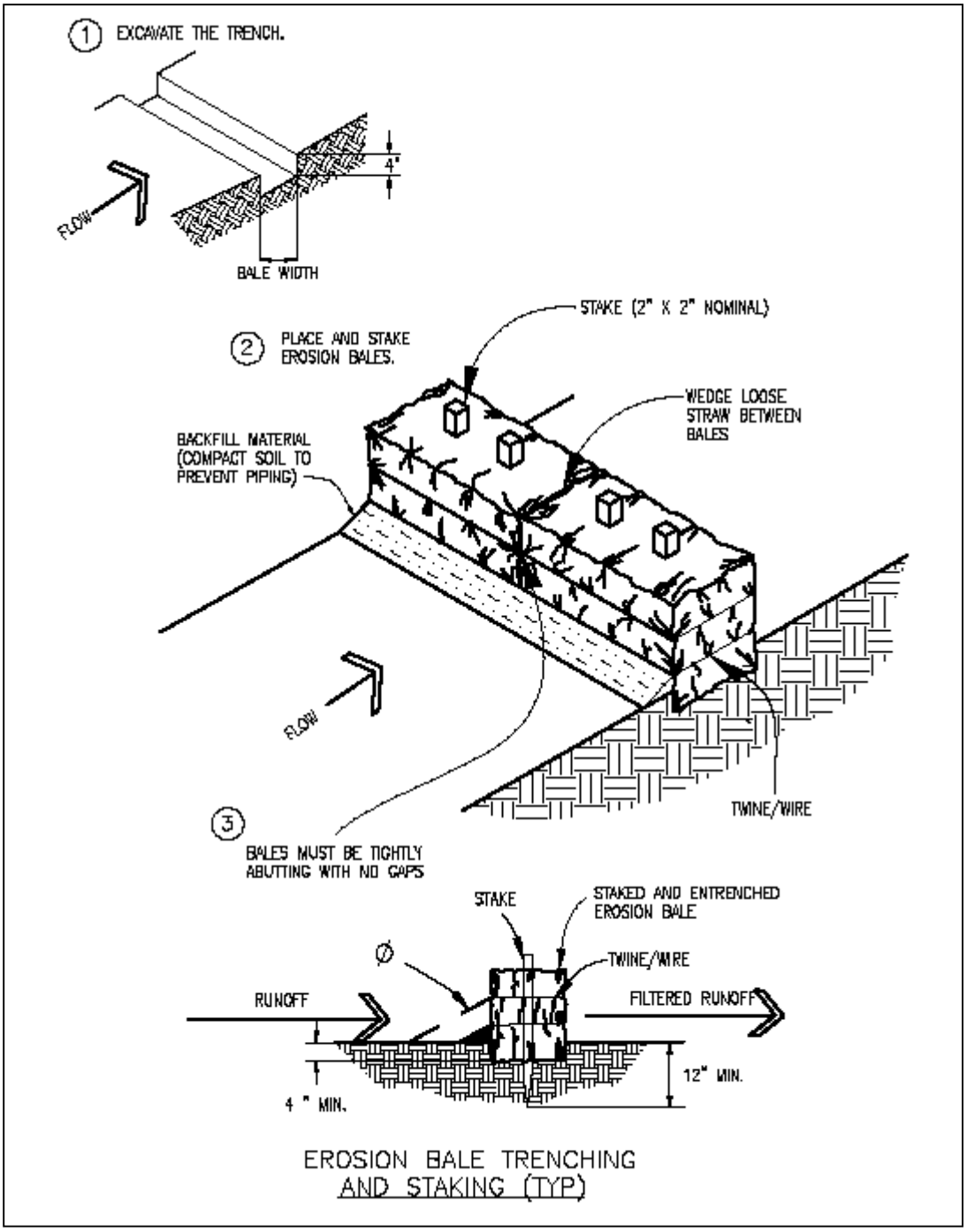


FIGURE SC 1.1
Erosion Bale Installation (CDOT[18])

- All bales must be either wire-bound or string-tied, and they should be installed so that bindings are oriented around the sides rather than along

the tops and bottoms of the bales (in order to prevent deterioration of bindings).

- The gaps between bales should be filled by wedging with straw to prevent water from escaping between the bales. The main consideration is to obtain tight joints. Erosion bales will not filter sediment or pond water if the water is allowed to flow between, around, or under the bales. Loose straw or hay scattered over the area immediately uphill from an erosion bale barrier tends to increase barrier efficiency.
- Along toe of fills, install the erosion bales along a level contour and leave enough area behind the barrier for runoff to pond and sediment to settle. A minimum distance of 5 feet from toe of the fill is recommended.

## Maintenance and Inspection

- Erosion bales deteriorate quickly and, therefore, inspections during construction should be frequent. Repair or replacement should be made promptly as needed.
- Erosion bales must be removed when they have served their usefulness.
- Trenches where erosion bales were located should be graded and stabilized.
- Sediment accumulation against the erosion bale barrier shall be removed when it reaches half the exposed bale height. Sediments removed must be properly disposed.
- Replace erosion bales as necessary but at a minimum of once each year.

# SC 2: Erosion Logs

## Description

Erosion logs filled with rock or other filter material used for erosion and sediment control.

## Applications

- Used upstream of curb inlets to filter sediment laden runoff. Logs of various length can be accommodated with multiple logs installed in series. Typical placement of a log is upstream of an inlet, in the gutter flow line, and also at the entrance of an inlet.
- Used as check dams in ditches and swales for erosion control until vegetative cover is established.
- Used as a temporary feature.

## Limitations

- Logs are manufactured BMPs. Refer to the manufacturer for guidelines on limitations.
- Do not use in ditches and swales with continuous flow.

## Material

- Several types of logs exist. A "gravel" log is typically a cylindrical shaped filter with ¼ inch mesh or burlap filter cover filled with ¾ inch gravel. Refer to the manufacturer for specific material specifications.

## Installation

General installation guidelines are provided, however, refer to the manufacturer for specific installation requirements.

### *Installation for Check Dam Applications*

- When using as a check dam, it should be placed in straight sections to minimize the potential for erosion in the channel bend.

### *Installation for Curb Inlet Protection (Upstream of inlet)*

- Logs will be used upgradient of inlet perpendicular to and flush with the curb.
- The maximum height of the curb log should be less than the top of the curb opening. This is to allow overflows to occur during large rainfall events even though sediment-laden runoff will enter the storm drainage system.
- No less than two 10-inch diameter logs must be used in sequence, spaced no more than five feet apart, upgradient of inlet. No less than six logs shall be used if the 4–inch log is chosen.
- Incline at 30 degrees from perpendicular, opposite the direction of flow.

### *Installation for Curb Inlet Protection (Entrance of inlet)*

- Identify curb opening dimensions to determine how many logs are required.
- Place the log(s) end-to-end along the curb inlet opening.
- Angle the ends of the log(s) towards the curb inlet opening.

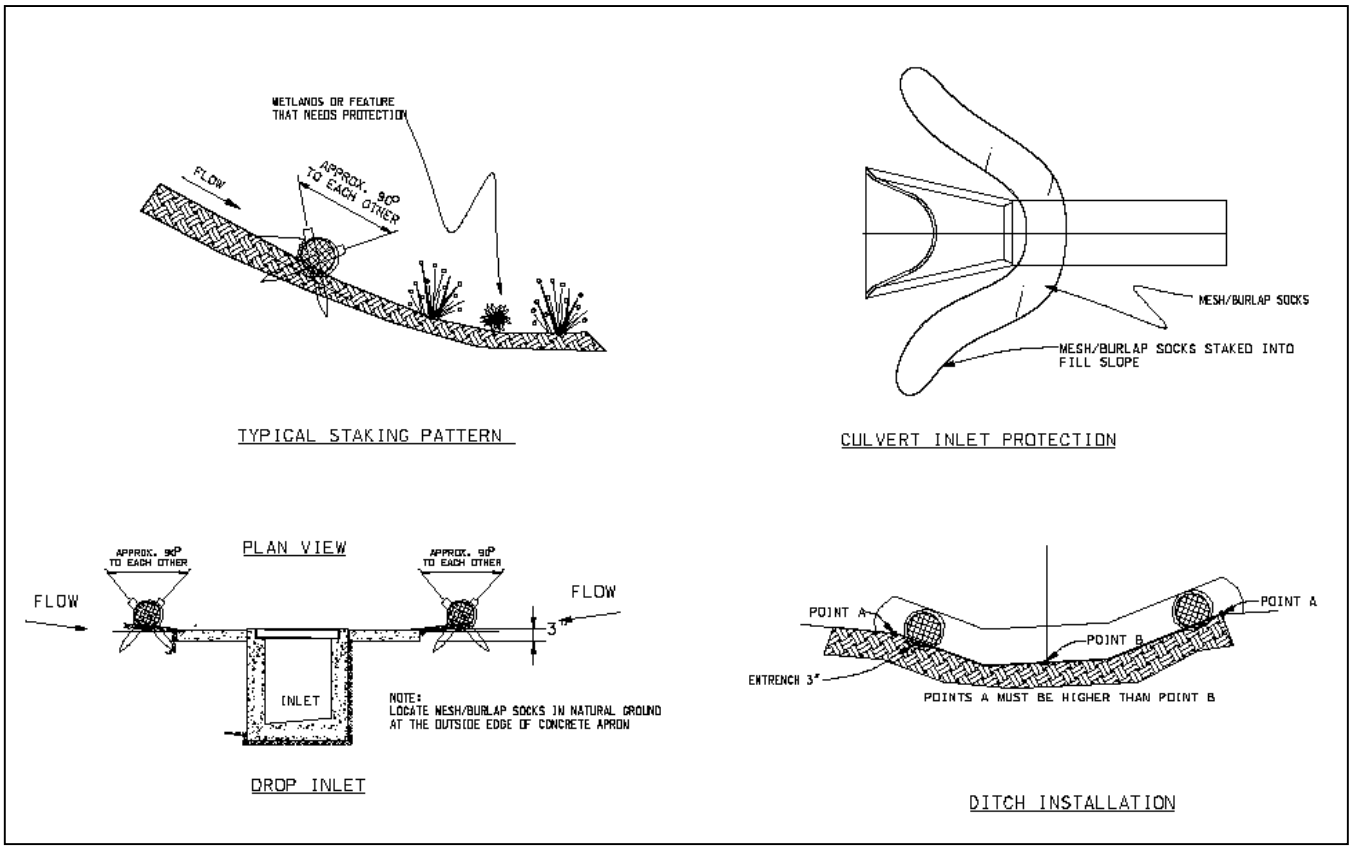


FIGURE SC 2.1
Applications for Erosion Logs (CDOT[18])

## Maintenance and Inspection

- Inspect logs daily for cuts, abrasions, and proper installation, replace or reposition daily. Remove sediment and dispose in a proper manner.
- Discontinue use if logs create a traffic hazard.

## About NILEX

At Nilex, we provide a new level of engineered science to an age-old industry. Our smart, innovative cost-cutting solutions are the answer for today's road building, drainage, foundation, erosion control, containment, and all geo-environmental and civil construction challenges.

Nilex products and technologies improve construction projects by lowering costs and offering a positive environmental impact. It's a win-win situation. We work closely with our customers to reduce the use of natural materials such as granulars, clays and import fill – replacing them with engineered, technically advanced synthetic materials.

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# NILEX GeoRidge®

*The original check dam*

# NILEX GeoRidge® Bio

*Biodegradable check dam*

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## GeoRidge® Check Dam

GeoRidge® is a permeable check dam designed for erosion and sediment control. It is constructed of a durable UV stabilized HDPE plastic and manufactured using a fully automated diecast process to ensure the highest quality and consistency.

## GeoRidge® Bio Check Dam

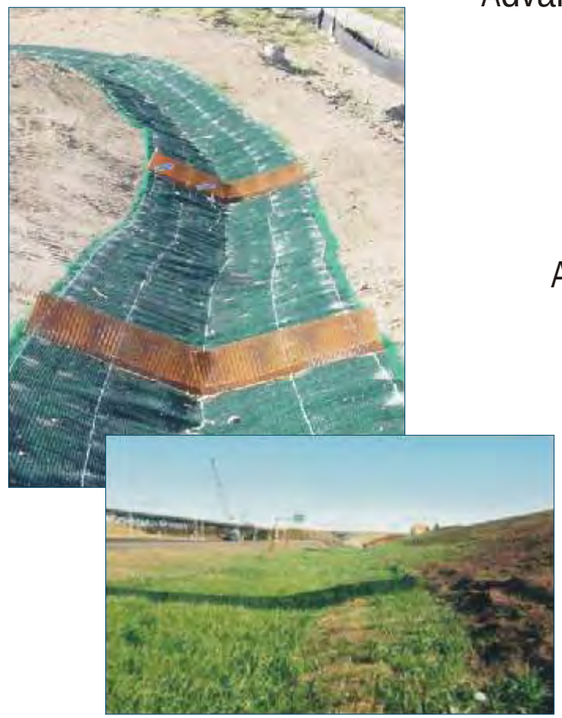
With the incorporation of technologically advanced additives, GeoRidge®Bio check dams will degrade over an 18 to 24 month period*. The interaction with environmental conditions and naturally occurring micro-organisms causes degradation of the material. Just install GeoRidge®Bio and nature will do the rest.

## How GeoRidge® Works

GeoRidge® and GeoRidge®Bio check dams have proven to be effective for erosion and sediment control. By acting as an energy dissipater, GeoRidge® reduces flow velocities causing silt and sediment to settle upstream. The reduced water velocity also results in minimized downstream erosion. Compared to straw bales, rock check dams, wattles, and other synthetic devices, GeoRidge® consistently outperforms and delivers superior results.

## Maximize Performance

To maximize GeoRidge® and GeoRidge®Bio performance, it is recommended that erosion control blankets be used in conjunction with these check dams. Erosion control blankets prevent undermining of the check dams and encourage the earliest possible vegetation growth.



## Advantages of GeoRidge® and GeoRidge®Bio

- Effective sediment trap
- Ease of installation
- Lightweight, portable and stackable
- Open structure, allows vegetation to establish
- Freestanding design
- Simple anchoring system
- Recyclable

## Additional Advantages of GeoRidge®Bio

- Biodegradable
- No need for removal

## GeoRidge® Applications

- Roadside channels/swales
- Stormwater channels
- Slopes

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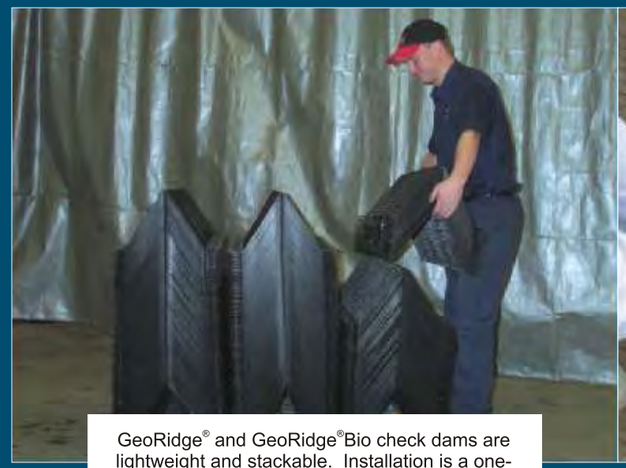
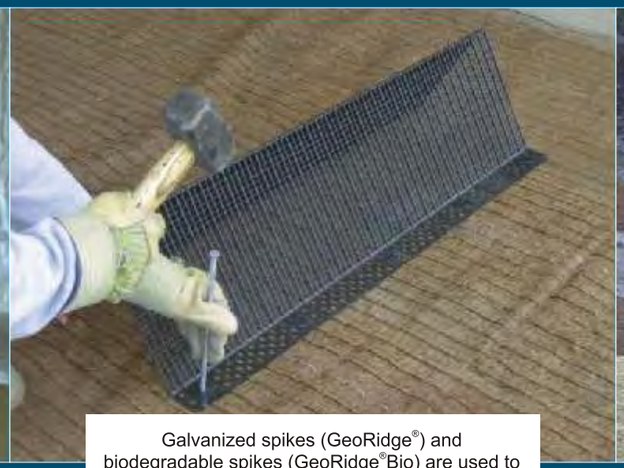
* Degradation time is dependent on environmental conditions.



GeoRidge® and GeoRidge®Bio check dams are lightweight and stackable. Installation is a one-person operation.



Galvanized spikes (GeoRidge®) and biodegradable spikes (GeoRidge®Bio) are used to secure the check dams.

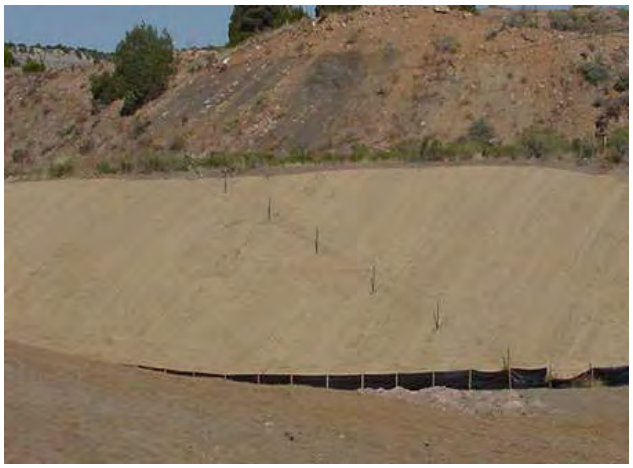
GeoRidge® check dams slow the flow of water. As the water flows through the check dam, its velocity and energy are reduced.

As a result, silt and sediment are deposited upstream of the berm aiding in sediment control.

# EC 5: Erosion Control Blankets

## Description

Organic or synthetic blankets installed on steep lopes or channels to prevent erosion until final vegetation is established.



## Applications

- Used to control erosion and promote the establishment of vegetation.
- Used to protect channels against erosion from concentrated runoff. Also refer to EC 6, Turf Reinforcement Mats, for additional types of erosion protection for areas with concentrated runoff.
- Used as a temporary feature.

## Limitations

- Blankets used on slopes should be biodegradable, or photodegradable, non-toxic to vegetation or germination of seed, and non-toxic or injurious to humans.
- Do not use on slopes where vegetation is already established.
- Use on slopes 2:1 or steeper. Also use in locations with 3:1 slopes facing south or west. Product must be reapplied 6-12 months after initial application. If used in conjunction with seeding, reapply every 6-12 months until vegetation is established.

## Design Guidelines

- For slope applications, selection of the appropriate material will depend on the amount of runoff, steepness of the slope, flow velocities, cost, ease of installation, type of soils, shear stress, and past experience.
- For channel applications, selection will be based mainly on shear stress. Refer to EC 6 for additional selections.
- Table EC 5.1 indicates dome recommended criteria for the selection of erosion control blankets.

TABLE EC 5.1
Seeding Season

| Condition | Blanket Type |
|---|---|
| Slopes 2:1 or Steeper | Straw Blanket<br>Straw/coconut blanket<br>Synthetic Blanket<br>Wood Fiber Blanket (excelsior) |
| Erosive soil (sand) or slopes receiving sheet flow from roadway surface runoff | Straw Blanket<br>Straw/coconut blanket<br>Synthetic blanket |

## Materials

- Combination Blankets: Consists of a photodegradable plastic netting which covers, and is entwined, in a natural organic or man-made mulching material. The mulching material can be wood-fiber, excelsior, straw, coconut fiber, manmade fiber, or a combination of the same. Some existing combinations are 100% coconut fiber, or 70% agricultural straw and 30% coconut fiber, or 100% agricultural straw.
- Jute mesh: Consists of a mat lining woven of undyed and unbleached jute yarn. Varies from 1/8" to ¼" in diameter. The mat weighs approximately 0.80 lbs per square yard, with openings about 3/8" by ¾". It can be used with or without straw underlay.
- Soil reinforcement mats: Formed by three-dimensional structures of entangled nylon monofilaments, melt-bonded at their intersections. These mats must be capable of maintaining its shape, and are generally highly resistant to environmental and ultraviolet degradation.

## Installation

- Areas where the blanket is to be used shall be properly prepared, fertilized, and seeded before the blanket is placed.
- Installation of the blankets shall be in accordance with the manufacturer's recommendations.
- The blanket shall be placed smoothly but loosely on the soil surface without stretching.
- Pins and staples shall be made of wire 0.162 inch or larger in diameter. "U" shaped staples shall have legs 8" long, and a 1" crown. "T" shaped pins shall have a minimum length of 8". The bar of the "T" shall be at least 4" long. Triangular survey stakes can also be used (see Figure 5.1).
- Staples shall be inserted in a pattern according to the manufacturer's recommendation.
- The upslope end of the blanket shall be buried in a trench 6" by 6" deep beyond the crest of the slope to avoid undercutting (see Figure EC 5.2).
- For slope applications, there shall be at least a 6" overlap wherever one roll of blanket ends and another begins, with the uphill blanket placed on top of the downhill blanket (see Figure EC 5.2).
- There shall be at least a 4" overlap wherever two widths of blanket are applied side by side (see Figure EC 5.2).
- In channels, the blanket shall be buried at terminal ends and every 35' in a trench 6" deep by 6" wide. Before backfilling, staples shall be placed across the width of the trench spaced at 6" on center in a zigzag pattern. The trench shall then be backfilled to grade and compacted by foot tamping.

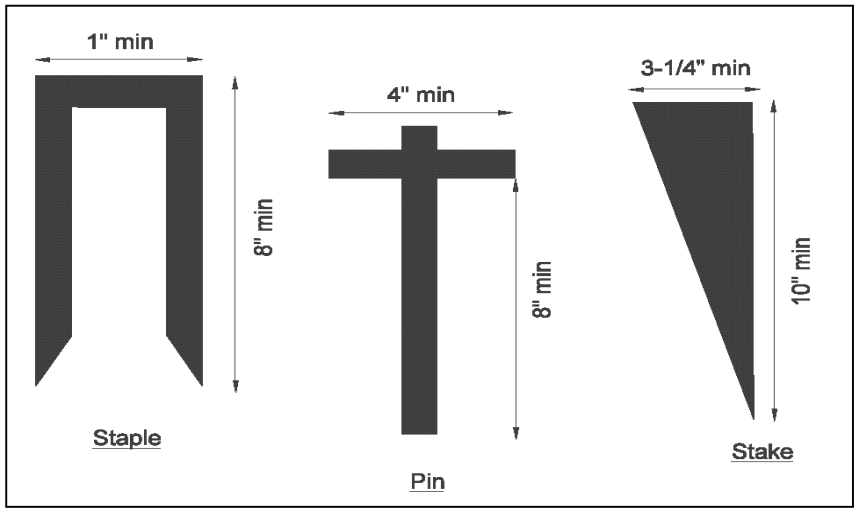



FIGURE EC 5.1
Erosion Control Blanket Anchors

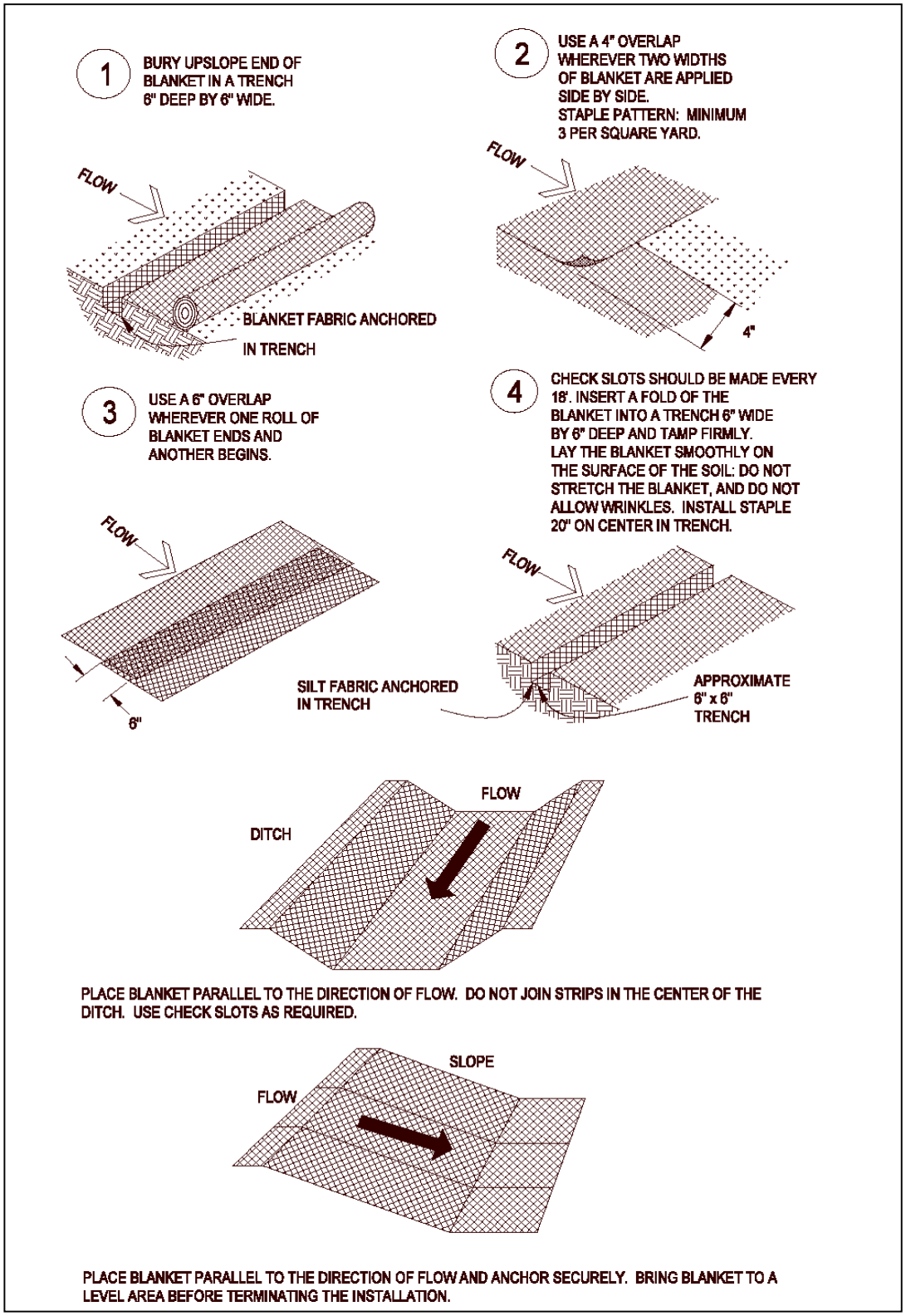



FIGURE EC 5.2
Erosion Control Blanket Installation

## Maintenance and Inspection

- Re-anchor loosened matting and replace missing matting and staples as required.
- Inspection shall be performed periodically especially after a storm event that results in runoff, and any required repairs or maintenance shall be executed immediately.

# EC 6: Turf Reinforcement Mats (TRM)

## Description

A rolled permanent erosion control product composed of UV-stabilized, non-degradable, synthetic materials (which may include an organic, biodegradable fiber component) processed into a three-dimensional matrix.

## Applications

- Used in ditches, swales, channels, and slopes where design discharges exert velocities and shear stresses that exceed the limits of mature, natural vegetation to prevent erosion.
- Used in transition areas before and after hard armor (i.e., riprap, concrete, asphalt etc.) to provide for stable and non-erosive transition.

## Limitations

- In an unvegetated state, velocities should not exceed 14 ft/sec maximum or the limitations provided by the manufacturer.
- In a vegetated state, velocities should not exceed 25 ft/sec maximum or the limitations provided by the manufacturer.
- Maximum slope is dictated by the soil stability and above referenced limited velocity and shear stress limitations.
- Soils must be conducive to the establishment of vegetation.

## Design Guidelines

- TRM may be installed as either an on-the-surface or soil-loaded system (for surface, see Figure EC 5.1; for soil-loaded, see Figure EC 5.2).
- TRM shall be unrolled in direction of flow with edges overlapped a minimum of 4 inches and end of rolls overlapped a minimum of 6 inches.
- Anchors for the TRM should be per manufacturer's recommendations for the particular TRM application and no less than two per square yard.

- TRM shall extend 2 feet minimum above the design maximum flow line in ditches, swales, and channels.
- Unless the TRM is anchored by a hard armor application, the leading edge of the TRM shall be buried and anchored per Figure EC 5.3.
- Soil-loaded system shall have no more than 1.5 to 2 inches of soil applied on the TRM.

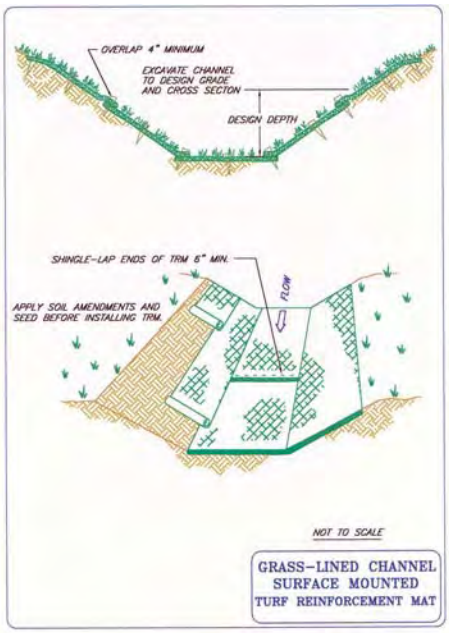



FIGURE EC 6.1
TRM in Ditch Application (CDOT[18])

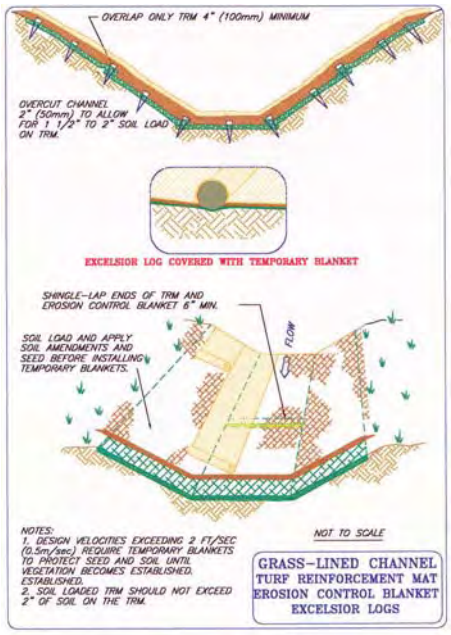



FIGURE EC 6.2
TRM in Ditch Application with Mesh/Burlap Socks (CDOT[18])

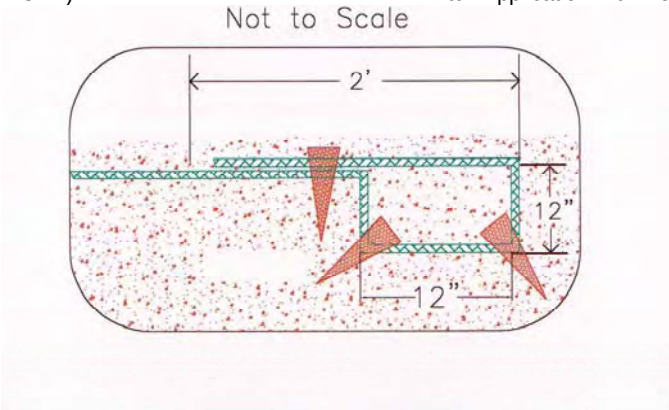



FIGURE EC 6.3
Trenching of TRM (CDOT[18])

## Installation

- All vegetation, roots, rocks, and other objectionable material shall be removed and disposed of so as not to create loss of soil contact by the TRM when installed.
- If TRM is not soil loaded, apply seed, soil amendments, etc. before installing TRM.
- If the TRM is soil loaded, follow installation of the TRM with seed and soil amendments. After soil loading the TRM, install an erosion control blanket as shown in Figure EC 6.2. Install the erosion control blankets in accordance with the manufacturers recommendation. General guidelines are included in BMP EC 11: Erosion Control Blanket.
- If mesh/burlap socks are used in conjunction with the soil-loaded system, they should be placed before the erosion control blanket and after soil loading. The erosion control blankets should be unrolled and closely stapled to the upper edge of the mesh/burlap sock; unrolled tightly over the mesh/burlap sock and stapled closely at the lower edge; and then continuously unrolled (see Figure EC 6.3).

## Maintenance and Inspection

- Re-anchor loosened matting and replace missing matting and staples as required.
- Inspection shall be performed periodically especially after a storm event that results in runoff, and any required repairs or maintenance shall be executed immediately.

# EC 3: Mulch Tackifier

## Description

An organic soluble powder adhesive used in the form of a water slurry to adhere native hay, straw, hydromulch, or seed to a surface and together. Derivative of plant material phyllium or Guar.

## Applications

- Used in combination with a native forage material for mulching applications.
- Used in combination with seed to adhere seed to soil.
- Used to adhere wood cellulose material (hydro mulch) to surface.
- Used to cover disturbances as temporary cover for wind erosion.

## Limitations

- Temporary measure to hold mulch material until native seeding is established.
- Product is water-soluble and must be reapplied 6-12 months after initial application if plants have not stabilized soils.
- Do not apply during precipitation event or over snow.
- Do not apply where in areas of concentrated flow.

## Design Guidelines

Design mixture as shown or as recommended by the manufacturer:

- 150-200 lbs of organic mulch tackifier per acre.
- 1,000 gallons of water per acre.
- 350 lbs of wood cellulose material per acre.

## Installation

- Apply within 4 hours of mulch application.
- Always apply in a liquid state.
- Can be applied in combination with organic fertilizers and humates.

## Maintenance and Inspection

- Mulch movement indicates poor application and product mixture.
- Proper application will bond mulch material together and to soil.
- Inspect by touching mulch surface to determine if adhesion has occurred.

# EC 2: Mulching

## Description

Application of plant residues to the soil surface. Typically mulching material includes certified weed free hay or straw, certified under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5, CRS and wood cellulose fiber.

## Applications

- Used in combination with mulch tackifier for temporary erosion control (i.e., incomplete slopes, detour slopes, stockpiles).
- Used in combination with mulch tackifier for temporary erosion control on slopes when seeding is not allowed due to seasonal constraints.
- Used to cover permanent or temporary seed areas.

## Limitations

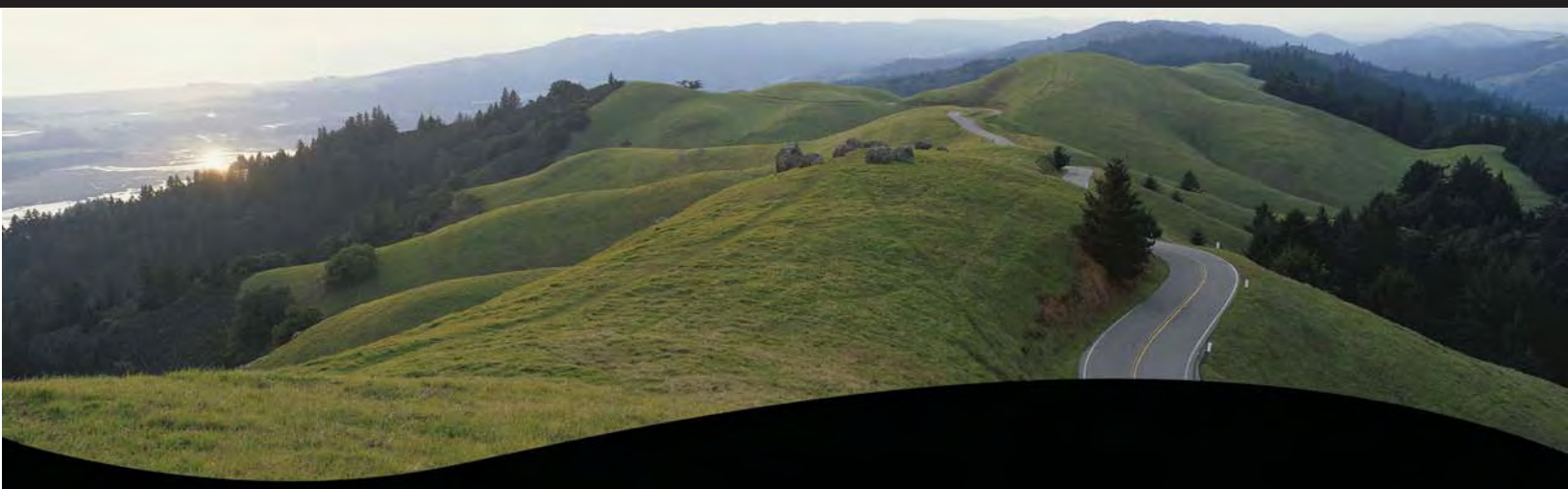
- Hay may have limited availability in the spring. When approved, straw may be substituted at 2 tons per acre.
- Hydromulch with wood cellulose fibers shall be limited to operations where precipitation is over 20 inches.
- Over spraying of hydromulch may result in erosion.
- Hydromulch shall not be done in the presence of free surface water.

## Installation

- Mulch shall be applied at a rate of 1 ½ to 2 tons per acre.
- At a minimum, 50% of the mulch, by weight, should be 10 inches or more in length.
- Depth of the applied mulch should not be less than 1 inch and mot more than 2 inches.
- Applied mulch should be uniformly distributed so that no more than 10% of the soil surface is exposed.
- Applied mulch should be anchored to the soil surface by using tackifier and mechanically crimping immediately after mulching or at least within 4 hours.
- Apply hydromulch immediately after seeding. Hydromulch mixture shall be applied at 2000 pounds per acre wood cellulose fiber mulch; 100 pounds per acre tackifier.

## Maintenance and Inspection

- Inspect frequently and reapply mulching in areas where the mulching has been loosened or removed. Mulch tackifier must be applied with additional applications of mulching.



The Ultimate Medium for
Erosion Control and Revegetation

Flexible Growth Medium™ (FGM™)

# Flexterra™

Profile™

*Your Trusted Partner In Soil Solutions™*

# The Right Chemistry Works Every Time.

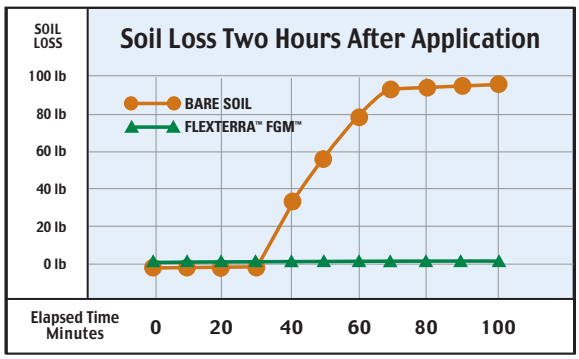
Wood Fibers
Interlocking Fibers
Co-Polymer Gel
Crosslinking Hydro-colloid Tackifier

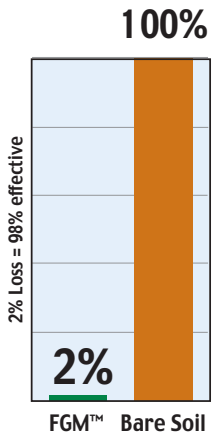
Flexterra™ uses patented technology combining both chemical and mechanical bonding techniques to lock the engineered medium in place. Crimped synthetic fibers, organic fibers and performance-enhancing additives form a lofty, interlocking matrix that creates air space and water-absorbing cavities which improve germination; reduce the impact of raindrop energy and minimize soil loss. Superior chemistry means no cure time, which enables the matrix to handle higher rates of surface flow energy from heavy rains—upon application. Water-resistant tackifiers and flocculants chemically bond the matrix to the soil surface.

**NO CURE TIME REQUIRED**

**Testing proves that Flexterra™ is 98% effective two hours after application.**

FGM™ application rate 3,000 lb per acre.
10-year storm event (2.1 inches)
San Diego State University Soil Erosion Research Laboratory (SDSU/SERL)




# Solves Problems on a Variety of Sites.

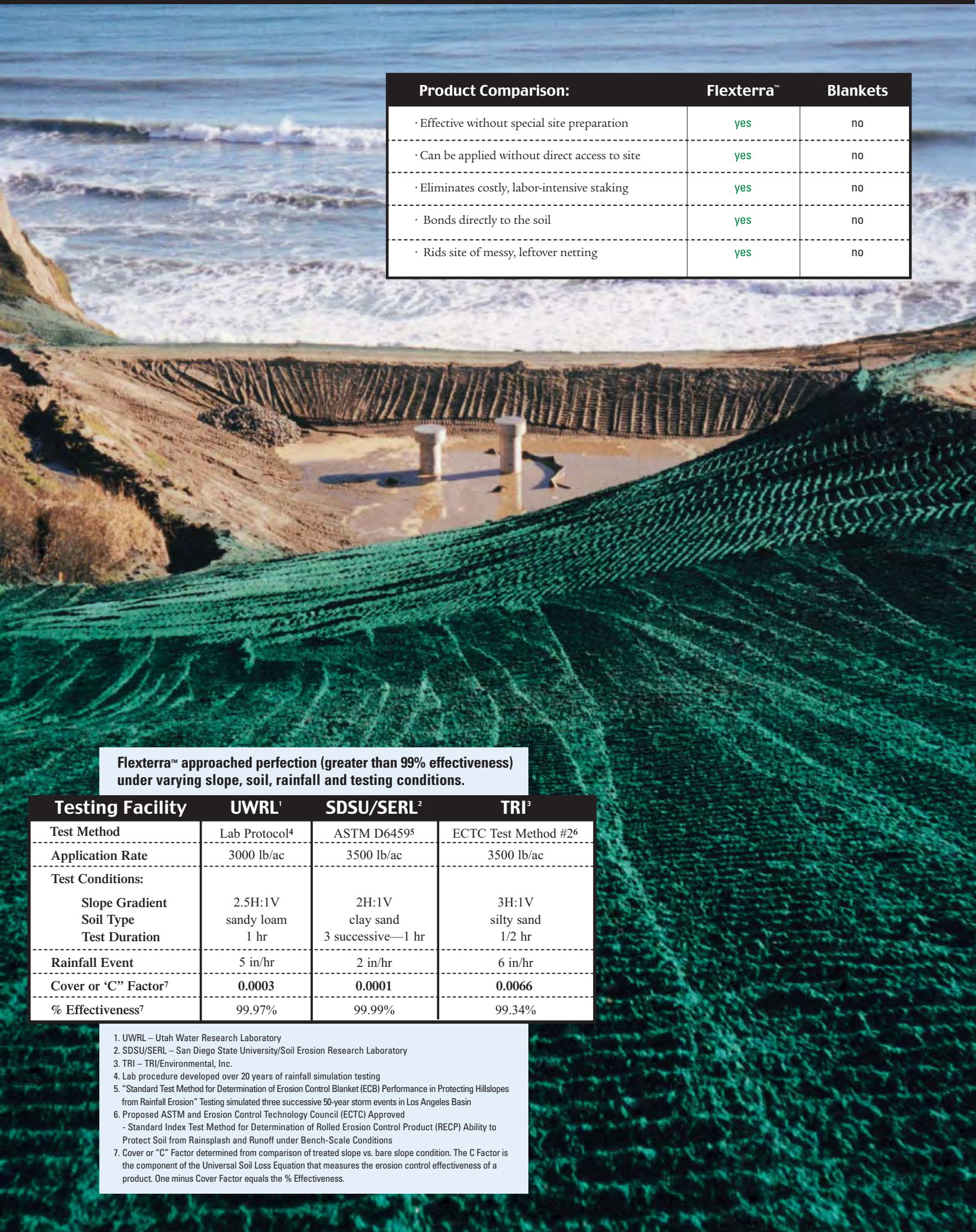
FGM™ has been used on projects ranging from rough ground and steep, rocky slopes to moderate- or steep-graded fill slopes. It is also used in environmentally sensitive wetlands and other wildlife areas not compatible with nettings. It has proven itself in a broad array of applications:

### DOT & Highway Projects
FGM™ can be applied quickly to small or large areas with no cutting, trimming or stapling involved. It has received DOT approval on a growing list of states.

### Mine Reclamation
FGM™ exceeds the rigid environmental standards that come with abandoned mined land (AML) reclamation projects.

### Commercial and Residential Construction
FGM™ doesn't require stakes that pose hazards and doesn't leave netting behind that can interfere with mowing.

### Golf Course Construction
FGM™ locks the soil and seed in place, allowing grass to mature into a healthy, dense cover at a fraction of the cost of sod.



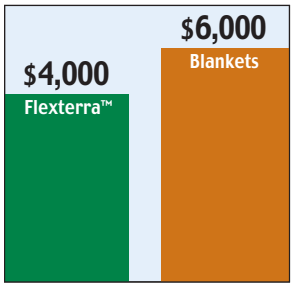
| Product Comparison: | Flexterra™ | Blankets |
|---|---|---|
| · Effective without special site preparation | yes | no |
| · Can be applied without direct access to site | yes | no |
| · Eliminates costly, labor-intensive staking | yes | no |
| · Bonds directly to the soil | yes | no |
| · Rids site of messy, leftover netting | yes | no |

**Flexterra™ approached perfection (greater than 99% effectiveness) under varying slope, soil, rainfall and testing conditions.**

| Testing Facility | UWRL[1] | SDSU/SERL[2] | TRI[3] |
|---|---|---|---|
| Test Method | Lab Protocol[4] | ASTM D6459[5] | ECTC Test Method #2[6] |
| Application Rate | 3000 lb/ac | 3500 lb/ac | 3500 lb/ac |
| Test Conditions: | | | |
| Slope Gradient | 2.5H:1V | 2H:1V | 3H:1V |
| Soil Type | sandy loam | clay sand | silty sand |
| Test Duration | 1 hr | 3 successive—1 hr | 1/2 hr |
| Rainfall Event | 5 in/hr | 2 in/hr | 6 in/hr |
| Cover or 'C" Factor[7] | **0.0003** | **0.0001** | **0.0066** |
| % Effectiveness[7] | 99.97% | 99.99% | 99.34% |

1. UWRL – Utah Water Research Laboratory
2. SDSU/SERL – San Diego State University/Soil Erosion Research Laboratory
3. TRI – TRI/Environmental, Inc.
4. Lab procedure developed over 20 years of rainfall simulation testing
5. "Standard Test Method for Determination of Erosion Control Blanket (ECB) Performance in Protecting Hillslopes from Rainfall Erosion" Testing simulated three successive 50-year storm events in Los Angeles Basin
6. Proposed ASTM and Erosion Control Technology Council (ECTC) Approved - Standard Index Test Method for Determination of Rolled Erosion Control Product (RECP) Ability to Protect Soil from Rainsplash and Runoff under Bench-Scale Conditions
7. Cover or "C" Factor determined from comparison of treated slope vs. bare slope condition. The C Factor is the component of the Universal Soil Loss Equation that measures the erosion control effectiveness of a product. One minus Cover Factor equals the % Effectiveness.

## Flexible Slope Protection at the Lowest Overall Cost.




**INSTALLED COST PER ACRE* INCLUDING SEED, FERTILIZER, AND LABOR**

**Flexterra™ dramatically reduces overall costs. The savings are even more dramatic when you consider the extensive soil preparation blankets require to minimize voids and bridging over the soil surface.**

*Based on installed rate at 3,500 lb per acre.

New Flexterra™ is a revolutionary component of Profile Erosion Control Solutions (PECS™), the industry's most comprehensive assortment of hydraulic mulch and erosion control blanket technology combined with on-site expertise and unfailing support. Like all products within the PECS arsenal, Flexterra™ is specifically engineered to deliver optimum performance under demanding conditions.

Nothing controls soil erosion and accelerates seed germination like Flexterra,™ the ultimate hydraulically applied blanket. Patented technology creates a Flexible Growth Medium™ (FGM™) that offers better protection on slopes than rolled erosion control blankets (ECB) and bonded fiber matrix (BFM) products—with the speed and cost savings of hydraulic seeding. Plus, it can be combined with other erosion control technologies to accommodate a broad range of conditions. At lower application rates, it can significantly and economically improve the performance of complementary technologies from straw blankets to turf reinforcement mats (TRM).

Flexterra™ is effective upon application. It requires no cure time to develop intimate soil contact. This engineered medium performs on slopes steeper than 2.5H:1V and remains effective even during sustained rainfall events. It can be applied using all types of mechanically agitated hydraulic seeding equipment over uneven terrain and rough seedbeds.

## It Doesn't Just Perform, It Outperforms.

**Flexterra™ has consistently outperformed any and all competitive vegetated slope protection technologies including Bonded Fiber Matrices and Erosion Control Blankets.**

Nothing compares to the performance of Flexterra™ when evaluated by the most prestigious slope erosion testing laboratories in North America. Flexterra™ performance has been proven.

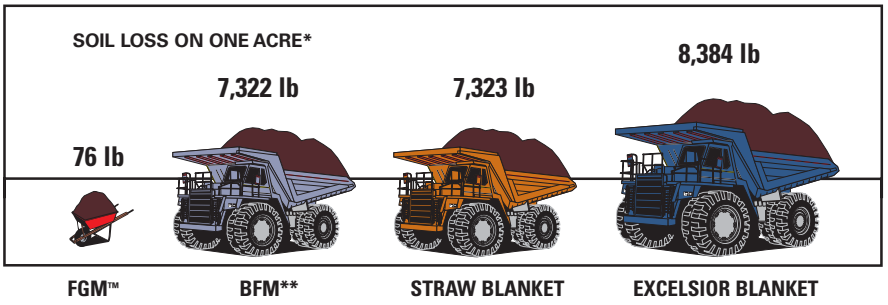
- Superior erosion control—0.0001 Cover (C) Factor from the Universal Soil Loss Equation translates to 99.9% effectiveness—or near perfection.
- Effective immediately—no cure time required.
- Fastest turf establishment—1500% water holding capacity delivers more moisture to the seedbed for better germination.
- 1/3 less expensive than blankets—less soil preparation is required.

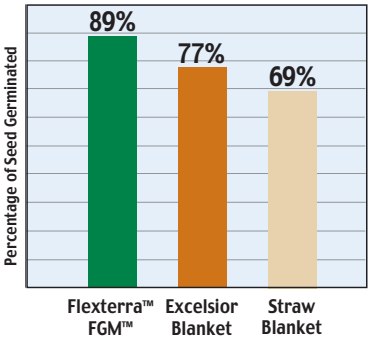
# Blanket and BFM Comparisons Fall Flat.

Flexterra™ is an effective alternative to erosion control blankets and BFMs. No straw or excelsior blanket alone can match Flexterra's™ slope protection, even on critical sites. The loft of the FGM™ matrix captures moisture and creates more air space to enhance seedling emergence. Flexterra™ absorbs and holds 5 times its weight in water, while standard excelsior blankets retain only twice their weight. The beauty of Flexterra™, however, is that it can be used a number of ways. For example, blankets and turf reinforcement mats (TRMs) will perform better when a protective layer of Flexterra™ is first applied at a reduced rate before installation.

Independent testing proves that Flexterra™ significantly out-performs excelsior and straw blankets as well as BFMs in preventing erosion. The results speak for themselves:

**NEARLY 100 TIMES LESS SOIL LOSS PER ACRE THAN BLANKETS AND BFMS.**




**PROMOTES MORE COMPLETE SEED GERMINATION THAN BLANKETS**

**Flexterra™ not only provides better immediate erosion control, independent testing also proves Flexterra™ provides better long-term control through more reliable and denser vegetation establishment.**

FGM™ application rate 3,000 lb per acre.
5" per hr. rain event on 2.5H:1V slope
for 1 hr. on sandy loam soil.
*Extrapolated from Utah research.
**Competitive BFM product

# Taking Erosion Control to a Whole New Level.

Although BFM technology has its place, Flexterra™ FGM™ is engineered for much tougher site and environmental conditions.

**Select FGM™ if:**

- The site requires stronger mechanical and chemical bonds to withstand greater surface flow and/or severe slopes
- Soil needs erosion protection for up to one year
- The site demands immediate erosion protection and you need to eliminate risk from impending weather
- You need the fastest vegetation establishment possible
- You require a high factor of design safety

**Select BFM if:**

- A chemical bond is strong enough to meet slope severity and length
- The required functional longevity of soil protection is 6 months or less
- The soil is dry and rain is not expected within 48 hours after application
- There is a high degree of certainty heavy rains will not follow application
- You require a moderate factor of design safety

# Flexible Growth Medium™ Specification

The Flexible Growth Medium™ (FGM™) shall be a hydraulically-applied, flexible erosion control blanket composed of long strand, thermally processed wood fibers, crimped, interlocking fibers and performance enhancing additives. The FGM™ requires no curing period and upon application forms an intimate bond with the soil surface to create a continuous, porous, absorbent and erosion resistant blanket that allows for rapid germination and accelerated plant growth.

The FGM™ shall be Flexterra™, as manufactured by Profile Products, LLC and shall conform to the property values listed below when applied at a rate of 3500 pounds per acre (3900 kilograms/hectare).

| PROPERTY | TEST METHOD | ENGLISH | SI |
|---|---|---|---|
| **Physical** | | | |
| Mass Per Unit Area | ASTM D-6566 | 11.5 oz/yd$^2$ | 390 g/m$^2$ |
| Thickness | ASTM D-6525 | 0.19 in | 4.8 mm |
| % Ground Cover | ASTM D-6567 | 99% | 99% |
| Water Holding Capacity | Proposed ASTM | 1500% | 1500% |
| Flexural Rigidity (wet) | ASTM D-6575 | 12 oz-yd | 10,000 mg-cm |
| Color (fugitive dye) | Observed | Green | Green |
| **Endurance** | | | |
| Functional Longevity | Observed | Up to 1 yr | Up to 1 yr |
| **Performance** | | | |
| Cover Factor (6 in/hr event) | ECTC Test Method #2 | 0.0066 | 0.0066 |
| % Effectiveness | ECTC Test Method #2 | 99.34% | 99.34% |
| Shear Stress | ECTC Test Method #3 | 1 lb/ft$^2$ | 48 Pa |

One minus Cover or "C" Factor equals the % effectiveness.

## INSTALLATION

Strictly comply with manufacturer's installation instructions and recommendations. Use approved hydro-spraying machines with fan-type nozzle (50-degree tip). To achieve optimum soil surface coverage apply FGM™ from opposing directions to soil surface.

Erosion Control and Revegetation:

Step One: Apply seed, fertilizer and other soil amendments with small amount of Flexterra™ for visual metering.
Step Two: Mix 50 lb of FGM™ per 125 gallons (23 kg/475 liters) of water; confirm loading rates with equipment manufacturer.

| SLOPE GRADIENT | ENGLISH | SI |
|---|---|---|
| ≤3H to 1V | 3000 lb/ac | 3400 kg/ha |
| >3H to 1V and ≤2H to 1V | 3500 lb/ac | 3900 kg/ha |
| >2H to 1V and ≤1H to 1V | 4000 lb/ac | 4500 kg/ha |
| >1H to 1V | 4500 lb/ac | 5100 kg/ha |
| Below ECB or TRM | 1500 lb/ac | 1700 kg/ha |
| As infill for TRM | 3500 lb/ac | 3900 kg/ha |

Consult comprehensive CSI formatted specification for additional details.

## PACKAGING

Bags: Net Weight - 50 lb, UV resistant plastic film.
Pallets: Weather-proof, stretch-wrapped with UV resistant pallet cover, 40 bags/pallet, 1 ton/pallet.

# Your Trusted Partner in Soil Solutions™

Profile Products is the world's largest producer of hydraulic mulch and hydraulic mulch additives, and a leader in erosion control and revegetation science. Many of today's industry standards were innovations introduced by Profile. Our leadership continues through aggressive research and development, active support of trade associations, and education designed to advance the industry's effectiveness and professionalism.

Profile™
*Your Trusted Partner In Soil Solutions™*

F-03

For technical information call 1-866-325-6262. For distributor location and customer service call 1-800-366-1180.

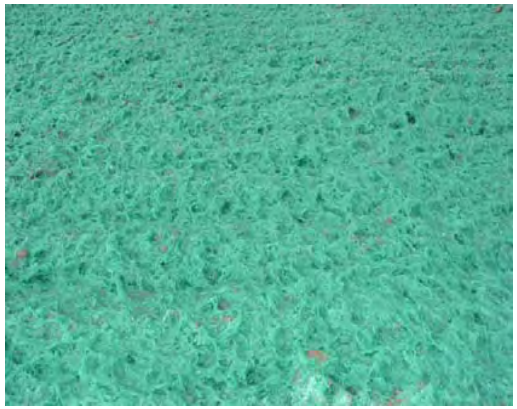
750 Lake Cook Road · Suite 440 · Buffalo Grove, IL 60089
www.profileproducts.com

# Application Rates, Loading Procedures and Loading Chart

## Application Rates

| Slope Condition | English | SI |
|---|---|---|
| ≤3H to 1V | 3000 lb/acre | 3400 kg/hectare |
| >3H to 1V and ≤2H to 1V | 3500 lb/acre | 3900 kg/hectare |
| >2H to 1V and ≤1H to 1V | 4000 lb/acre | 4500 kg/hectare |
| >1H to 1V | 4500 lb/acre | 5100 kg/hectare |
| Below ECB or TRM | 1500 lb/acre | 1700 kg/hectare |
| As infill for TRM | 3500 lb/acre | 3900 kg/hectare |

## Proper Application



## Improper Application

## Loading/Application Procedures

1. Fill 1/3 of mechanically agitated hydroseeder with water. Turn pump on for 15 seconds and purge and pre-wet lines. Turn pump off.
2. Turn agitator on and load low density materials first (i.e. seed).*
3. Continue filling tank with water while loading Flexterra fiber into the tank.
4. Flexterra should be completely loaded before water level reaches 90% of the top of tank.
5. Add fertilizer and top off with water.
6. Mix until all fiber is fully broken apart and hydrated (min. 10 minutes).
7. Shut off recirculation valve, slow down agitator and start applying Flexterra with a 50 degree fan tip nozzle.
8. Spray in opposing directions for 100% soil coverage.
9. Two-step application is preferred for best results.
10. To ensure proper application, area needs to be staked out prior to application to ensure the correct poundage rate.

*Do not add tackifiers, polymers or other filler materials with Flexterra.

**3,000 lb/acre**

**4.1mm thickness**

**3,500 lb/acre**

**4.8mm thickness**

**4,000 lb/acre**

**5.5mm thickness**

Questions?
Need more information?
Contact
Profile Products at
800-508-8681
www.flexterra.com
www.profileproducts.com

# Flexterra® Flexible Growth Medium (FGM) Loading Chart

Profile™ Your Trusted Partner In Soil Solutions

| FGM 50 lb bales | FGM LBS | Water (gals) | Working Capacity Displacement (gals) | 3000 lb/ac Sq Ft | Acres | 3500 lb/ac Sq Ft | Acres | 4000 lb/ac Sq Ft | Acres | 4500 lb/ac Sq Ft | Acres |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 50 | 125 | 140 | 726 | 0.017 | 622 | 0.014 | 545 | 0.013 | 484 | 0.011 |
| 2 | 100 | 250 | 280 | 1,452 | 0.033 | 1,245 | 0.029 | 1,089 | 0.025 | 968 | 0.022 |
| 3 | 150 | 375 | 420 | 2,178 | 0.050 | 1,867 | 0.043 | 1,634 | 0.038 | 1,452 | 0.033 |
| 4 | 200 | 500 | 560 | 2,904 | 0.067 | 2,489 | 0.057 | 2,178 | 0.050 | 1,936 | 0.044 |
| 5 | 250 | 625 | 700 | 3,630 | 0.083 | 3,111 | 0.071 | 2,723 | 0.063 | 2,420 | 0.056 |
| 6 | 300 | 750 | 840 | 4,356 | 0.100 | 3,734 | 0.086 | 3,267 | 0.075 | 2,904 | 0.067 |
| 7 | 350 | 875 | 980 | 5,082 | 0.117 | 4,356 | 0.100 | 3,812 | 0.088 | 3,388 | 0.078 |
| 8 | 400 | 1,000 | 1,120 | 5,808 | 0.133 | 4,978 | 0.114 | 4,356 | 0.100 | 3,872 | 0.089 |
| 9 | 450 | 1,125 | 1,260 | 6,534 | 0.150 | 5,601 | 0.129 | 4,901 | 0.113 | 4,356 | 0.100 |
| 10 | 500 | 1,250 | 1,400 | 7,260 | 0.167 | 6,223 | 0.143 | 5,445 | 0.125 | 4,840 | 0.111 |
| 11 | 550 | 1,375 | 1,540 | 7,986 | 0.183 | 6,845 | 0.157 | 5,990 | 0.138 | 5,324 | 0.122 |
| 12 | 600 | 1,500 | 1,680 | 8,712 | 0.200 | 7,467 | 0.171 | 6,534 | 0.150 | 5,808 | 0.133 |
| 13 | 650 | 1,625 | 1,820 | 9,438 | 0.217 | 8,090 | 0.186 | 7,079 | 0.163 | 6,292 | 0.144 |
| 14 | 700 | 1,750 | 1,960 | 10,164 | 0.233 | 8,712 | 0.200 | 7,623 | 0.175 | 6,776 | 0.156 |
| 15 | 750 | 1,875 | 2,100 | 10,890 | 0.250 | 9,334 | 0.214 | 8,168 | 0.188 | 7,260 | 0.167 |
| 16 | 800 | 2,000 | 2,240 | 11,616 | 0.267 | 9,957 | 0.229 | 8,712 | 0.200 | 7,744 | 0.178 |
| 17 | 850 | 2,125 | 2,380 | 12,342 | 0.283 | 10,579 | 0.243 | 9,257 | 0.213 | 8,228 | 0.189 |
| 18 | 900 | 2,250 | 2,520 | 13,068 | 0.300 | 11,201 | 0.257 | 9,801 | 0.225 | 8,712 | 0.200 |
| 19 | 950 | 2,375 | 2,660 | 13,794 | 0.317 | 11,823 | 0.271 | 10,346 | 0.238 | 9,196 | 0.211 |
| 20 | 1000 | 2,500 | 2,800 | 14,520 | 0.333 | 12,446 | 0.286 | 10,890 | 0.250 | 9,680 | 0.222 |
| 21 | 1050 | 2,625 | 2,940 | 15,246 | 0.350 | 13,068 | 0.300 | 11,435 | 0.263 | 10,164 | 0.233 |
| 22 | 1100 | 2,750 | 3,080 | 15,972 | 0.367 | 13,690 | 0.314 | 11,979 | 0.275 | 10,648 | 0.244 |
| 23 | 1150 | 2,875 | 3,220 | 16,698 | 0.383 | 14,313 | 0.329 | 12,524 | 0.288 | 11,132 | 0.256 |

*****Additional Notes*****

*For hose application, 35 lbs / 100 gallons is recommended

*Extremely rough grades will require more product

*Be sure to allow for residual material in tank on subsequent applications